FRD Activities Report
April 2003

Research Programs

ET Probe

Major revisions to the ET Probe data acquisition software were completed in late April. (The ET probe is being developed to be deployed in land-falling hurricanes to measure turbulence.) Bench tests of the software were performed to ensure all the pressure and temperature sensors were working properly and were reasonably calibrated. A road test was then conducted on 25 April, in which the ET probe was mounted on a pickup truck side-by-side with a cup anemometer and wind vane. The truck was then driven at highway speeds on a road heading into the desert west of Idaho Falls. This test proved to be highly encouraging.

Figure 1 shows plots of wind speed from the ET Probe and cup anemometer over about 17 minutes of the road test. The truck made several stops and starts during the period, and also reversed direction on the road. The curves are almost on top of one another except at low speeds. During the test, the ET probe was manually rotated about its vertical axis by 360° to determine whether the probe's performance varies with the direction of the oncoming flow. No errors were discernable in the probe's wind speed during the rotation.

Figure 2 shows a scatter plot of the ET probe wind speed versus the cup anemometer speed. The probe appears to

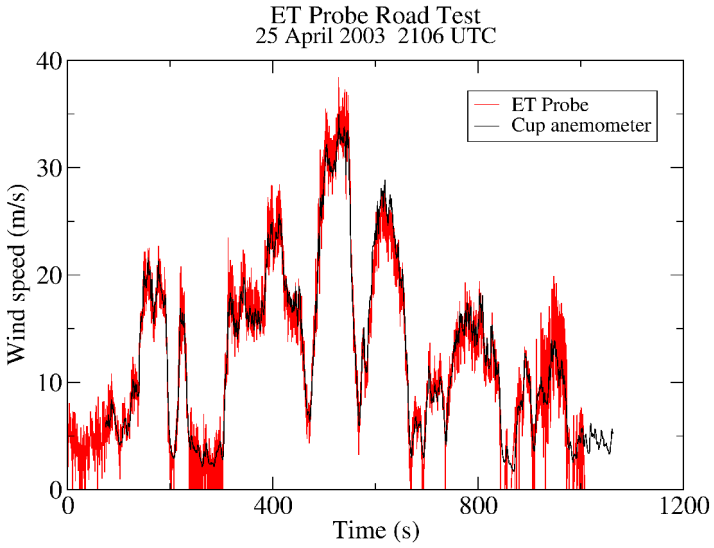

Figure 1. Wind speeds from cup anemometer and ET probe during road test

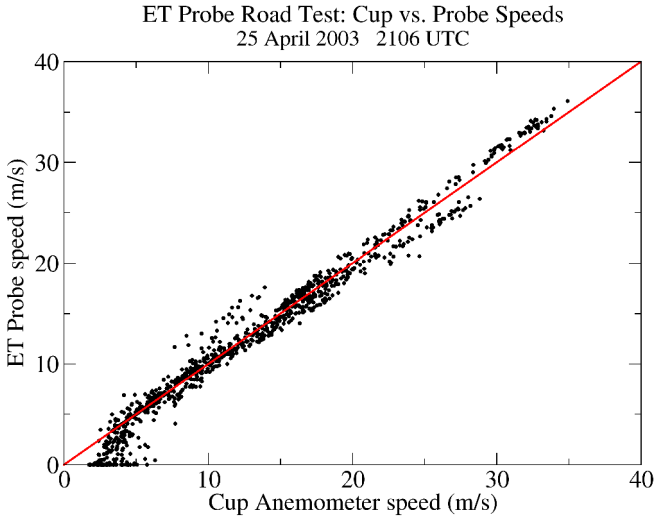

Figure 2. Scatter plot of ET probe wind speed versus cup anemometer speed during road test.

provide reasonable wind-speed values down to about 5 m/s, which is a lower speed threshold than had been anticipated. At speeds greater than about 25 m/s, the ET probe speeds tend to trend above the cup anemometer speed. Of course, cup anemometers have there own quirks, so this deviation from the one-to-one line does not automatically indicate a problem with the ET probe. There are also two groupings of points in Figure 2 that deviate more significantly from the one-to-one line. The preliminary explanation for these points is that they are associated with periods when there was more of a crosswind relative to the truck. The instruments were not mounted high enough above the truck cab to totally eliminate flow distortions caused by the truck itself. When there is a stronger crosswind, the flow distortions will not be symmetric across the top of the cab, so there is no reason to expect that the instruments will see exactly the same wind.

Further tests will be conducted in May. The relatively low threshold speed for the ET probe opens up some additional opportunities for static tests on breezy days. This project is still hampered by delays in the FY 2003 funding from the Office of Naval Research. (Richard.Eckman@noaa.gov, Tom Strong, Jeff French)

IMS Development Project

Sun Nuclear Corporation is developing a new RF-IMS instrument and have been testing their prototypes for SF_6 sensitivity for us. An RF-IMS uses a high frequency electric field perpendicular to the direction of ion travel to separate ions as they move through the drift region. Theoretically, they provide higher sensitivity than standard IMS instruments. Unfortunately, their latest prototype could not detect 20 parts per billion (ppb) SF_6. We require a sensitivity of about 20 part per trillion (ppt) SF_6. (Roger.Carter@noaa.gov, Debbie Lacroix, Shane Beard)

JOINT URBAN 2003 (JUT)

Preparations for field deployment to Oklahoma City in late June are in high gear. Seventy new samplers are under construction (Figure 3) as well as approximately 300 new cartridges. Construction will be complete in late May or early June. (Randy.Johnson@noaa.gov)

Figure 3. Randy Johnson inspects newly constructed SF_6 bag sampler and cartridge.

An updated experiment plan for field deployment was received in preparation for a field experimenter's meeting in Oklahoma City 31 March-04 April. The numerous proposed release sites and the many participants combined with the various test wind regimes, has also resulted in a very complex experimental plan.

The month was spent mostly in implementing the plan for FRD by breaking the plan into discrete tasks for FRD personnel. A revised sampler location plan was submitted to the science team for comment. (Kirk.Clawson@noaa.gov)

Gas chromatograph (GC) optimization for determining SF_6 concentrations in bag samplers continues. GC#1 has proven highly effective and reliable in measurements from 1.97 ppt to 50,500 ppt using the 500 µl sample loop. Measurements using the 250 µl sample loop seem to be reliable from 10 ppt to 200,000 ppt. GC#3 is able to see similar concentrations using the same sample loop sizes although there is less reliability. The ranges for this instrument may need to be adjusted slightly. Optimization will continue on GC#2 and GC#4 next month and detection limit studies will be conducted on all GC's during the month of May and into June to determine an appropriate average instrument limit of detection (ILOD) and instrument limit of quantitation (ILOQ). Method detection limit studies will be conducted in May to determine acceptance criteria for field data. (Debbie@noaa.inel.gov)

On April 24 and 25, we provided training to two college students who will work with us on the JUT project. Training covered sampler operations, continuous analyzer operation, gas chromatograph operations, as well as standard hazardous materials handling and safety training. We took advantage of the time the continuous analyzers were running to test a sample of nitrogen gas from our supplier in Oklahoma City. We found no problems with it but will complete further testing on the GC's to be sure we avoid contamination problems. (Roger.Carter@noaa.gov, Debbie Lacroix)

We are doing extensive testing on the new bag samplers being constructed for JUT. We have solved a number of operational problems, but are having some difficulty getting the field controls to provide results within specifications. We are experimenting with several purging methods and hope to resolve the problem in the next few days. (Roger.Carter@noaa.gov, Randy Johnson, Debbie Lacroix)

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BRACE

We are continuing to analyze BRACE data. The chemistry data has been processed data and we have a valid, quality-controlled data set. We are not working on interpretation of the results. We are also continuing examination of the relevant scientific literature. (tom.watson@noaa.gov)

CLAST-High

Preparations continue for the summer 2003 hurricane season. In April, two new aluminum spheres were fabricated to replace the prototype fabricated during last year's hurricane season. The new spheres are more robust and weigh less than the prototype. The spheres also require less labor in the manufacturing process. Work continues on software upgrades to the data system. These upgrades focus on some limited capabilities for real-time calculations of the wind, temperature, and moisture and significantly improved graphics/display capabilities. The system is slated for installation on the P3 in early June with test flights in late July. (Jeff.French@noaa.gov)

CBLAST-Low

ONR approved our recently submitted budget request for continued funding (at a reduced level) for FRD's involvement in CBLAST-Low. With the loss of the LongEZ and the departure of Jerry Crescenti (the original PI), it was unclear what role FRD would be allowed to play in CBLAST-Low. ONR approved our request to focus on analysis of data collected during the 2001 field campaign during which the LongEZ flew approximately 100 research flight hours. The four primary objectives laid out in the proposal are: (1) to complete the comparison of LongEZ measured winds with SAR-calculated winds, (2) to extend the analysis of the determination of transfer coefficients and how they relate to sea-state, (3) to complete the analysis of temperatures from the FUST probe, and (4) to support other scientific users of the LongEZ data. (Jeff.French@noaa.gov, Tammi Grimmett)

Refractive Turbulence

Work continues on analysis of data collected during last summer's field campaign in Adelaide, Australia. Currently, comparisons are being conducted between two methods used to calculate winds from the Egrett data: winds from software provided by ARA and a method devised by ARL. At this time the comparison is reasonable, but more work needs to be done. (Jeff.French@noaa.gov)

Cooperative Research with INEEL

Emergency Operations Center (EOC)

Neil Hukari and Roger Carter participated in a drill at the INEEL Emergency Operations Center (EOC) during the afternoon of April 2. The drill scenario consisted of a sulfuric acid spill from a tanker trailer vehicle at a facility inside the INEEL. FRD personnel provided forecasting and diffusion modeling support during the drill. (Neil.Hukari@noaa.gov, Roger Carter)

Kirk Clawson and Brad Reese participated in another INEEL EOC Drill on April 16. The drill scenario was the same as the April 2 drill. (Kirk.Clawson@noaa.gov and Brad Reese)

FRD Team D participated in a drill at the INEEL Emergency Operation Center on 23 April. The

NOAA contribution to the drill went smoothly. Most of the software glitches that were encountered in an earlier Team D drill this year were fixed by the time of this drill. (Richard.Eckman@noaa.gov, Debbie Lacroix)

INEEL Support

In late March FRD received a request for INEEL dispersion estimates based on Mesonet data from calendar year 2002. These requests are made annually as part of INEEL's Annual Site Environmental Report. The 2002 dispersion estimates were completed in mid April using the MDIFFH puff model, and the results were sent to the appropriate INEEL contractors. (Richard.Eckman@noaa.gov)

The recent completion of a long-term study of dispersion at INEEL (see NOAA Tech Memo OAR ARL-246, available in pdf format at www.noaa.inel.gov/personnel/Eckman) is having some consequences for risk assessment planning at INEEL. The report describes various definitions of "worst-case" dispersion estimates that have been used in past planning, and attempts to clarify the assumptions that go into each definition. Some of the past assessments may have favored definitions that gave lower concentration estimates without understanding the underlying assumptions. Meetings are being held with INEEL contractors to discuss which definitions of worst-case dispersion best meet the needs of the risk assessments. (Richard.Eckman@noaa.gov)

Other Activities

Safety

First Aid and CPR training were given to almost all employees on April 1st. Those that could not attend the session were rescheduled. (Debbie@noaa.inel.gov).

The NOAA safety video, "Compressed Gases-Safe Handling" was shown at the monthly staff meeting on April 9th. (Debbie@noaa.inel.gov)

Travel

Kirk Clawson to Oklahoma City 31 March-04 April to attend a Joint Urban 2003 planning meeting and to begin preparations for the June field deployment.